WHAT IS CLAIMED IS:

1. An ultrasonic diagnostic imaging system for three dimensional scanning comprising:

an array transducer having a plurality of transducer elements;

a beamformer coupled to the array transducer which causes the transducer to scan a volumetric region with a plurality of transmit beams and to receive echo information in response to transmit beams, the beamformer controlling the point spread functions of beams transmitted and/or received by the beamformer;

an image processor coupled to the beamformer which produces image signals in response to the echo information; and

a display coupled to the image processor,

wherein beams produced by the beamformer exhibit a first point spread function when the volumetric region is scanned with a first line density and a second point spread function when the volumetric region is scanned with a second line density.

2. The ultrasonic diagnostic imaging system of Claim 1, wherein the point spread function comprises the two-way spatial response at a focal region of pulse-echo spatial sampling of the volumetric region.

3. The ultrasonic diagnostic imaging system of Claim 1, wherein the transmit beams exhibit a relatively narrower beam profile at the focus when scanning the volumetric region with a first line density, and the transmit beams exhibit a relatively broader beam profile at the focus when scanning the volumetric region with a second line density which is less than the first line density.

4. The ultrasonic diagnostic imaging system of Claim 3, wherein adjacent beams overlap at substantially the same intensity levels when scanning the volumetric region with the first and second line densities.

5. The ultrasonic diagnostic imaging system of Claim 4, wherein the transmit beams satisfy the Nyquist criterion for spatial sampling of the volumetric region

to substantially the same degree.

6. The ultrasonic diagnostic imaging system of Claim 1, wherein the point spread functions satisfy the Nyquist criterion for spatial sampling of the volumetric region to substantially the same degree.

7. The ultrasonic diagnostic imaging system of Claim 1, wherein the beam point spread function exhibit both an azimuth dimension and an elevation dimension;

wherein point spread function is symmetrical in both the azimuth and elevation dimensions.

8. The ultrasonic diagnostic imaging system of Claim 1, wherein the beam point spread function exhibit both an azimuth dimension and an elevation dimension;

wherein point spread function is asymmetrical in the azimuth and elevation dimensions.

9. An ultrasonic diagnostic imaging system for three dimensional scanning comprising:

an array transducer having a plurality of transducer elements;

a beamformer coupled to the array transducer which causes the transducer to scan a volumetric region with a plurality of transmit beams and to receive echo information in response to transmit beams, the beamformer controlling the point spread functions of beams transmitted and/or received by the beamformer by control of the aperture function of the array transducer;

an image processor coupled to the beamformer which produces image signals in response to the echo information; and

a display coupled to the image processor,

wherein the beamformer utilizes a first aperture function when the volumetric region is scanned with a first line density and a second aperture function when the volumetric region is scanned with a second line density.

10. The ultrasonic diagnostic imaging system of Claim 9, wherein the aperture function comprises the combination of the elements used in an active aperture of the array transducer and the apodization function of the elements of the active aperture.

11. The ultrasonic diagnostic imaging system of Claim 10, wherein the apodization function is controlled to match the point spread function to the line spacing when scanning the volumetric region with the first and second line densities.

12. The ultrasonic diagnostic imaging system of Claim 11, wherein the first line density is greater than the second line density; and

wherein the apodization function is controlled to scan an increased depth-of-field when scanning the volumetric region with the second line density.

13. The ultrasonic diagnostic imaging system of Claim 10, wherein the apodization function comprises the relative weighting of signals of the respective elements of the active aperture during a transmission or reception event.

14. The ultrasonic diagnostic imaging system of Claim 9, wherein the first and second aperture functions satisfy the Nyquist criterion for spatial sampling of the volumetric region to substantially the same degree.

15. The ultrasonic diagnostic imaging system of Claim 14, wherein the first and second aperture functions both substantially exactly satisfy the Nyquist criterion for spatial sampling of the volumetric region.

16. The ultrasonic diagnostic imaging system of Claim 10, wherein the scanning beams exhibit a substantially constant angular sampling density; and

wherein the apodization function is varied as a function of beam angle to compensate for transducer acceptance angle effects.

17. In an ultrasonic diagnostic imaging system for volumetric scanning and which includes a user interface, a method for determining the point spread function used to spatially sample a volumetric region comprising:

determining the desired size of the volumetric region to be scanned;

determining the desired volume acquisition rate;

calculating the line density for scanning the volumetric region of the desired size at the desired volume acquisition rate; and

calculating the point spread function which will spatially sample the volumetric region at the line density.

18. The method of Claim 17, wherein calculating the point spread function further comprises calculating the point spread function which satisfies the Nyquist criterion for spatial sampling of the volumetric region to a desired degree.

19. The method of Claim 17, further comprising:

determining an aperture function that provides the calculated point spread function.

20. The method of Claim 19, wherein determining an aperture function comprises determining an apodization function for an active aperture that provides the calculated point spread function.

21. The method of Claim 17, wherein determining the desired volume acquisition rate comprises determining the volume frame rate of display.

22. The method of Claim 17, wherein calculating the point spread function comprises determining an aperture function which is approximately inversely proportional to a desired point spread function.